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GB 913805
GB 673787
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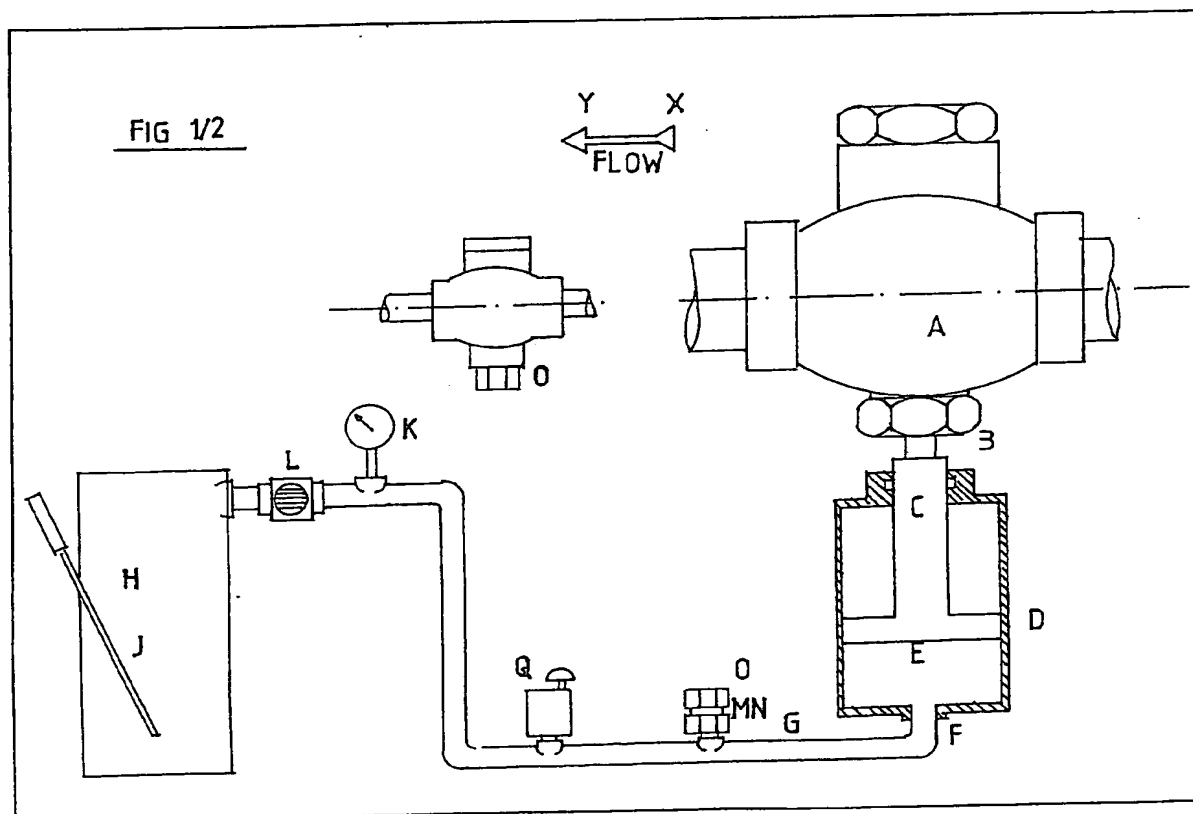
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(54) Fire and hazard protection system

(57) A valve A in a pipeline is normally held open by a ram C pressurised by a pump H and closed when one or more fusible caps M are opened by increase in temperature.

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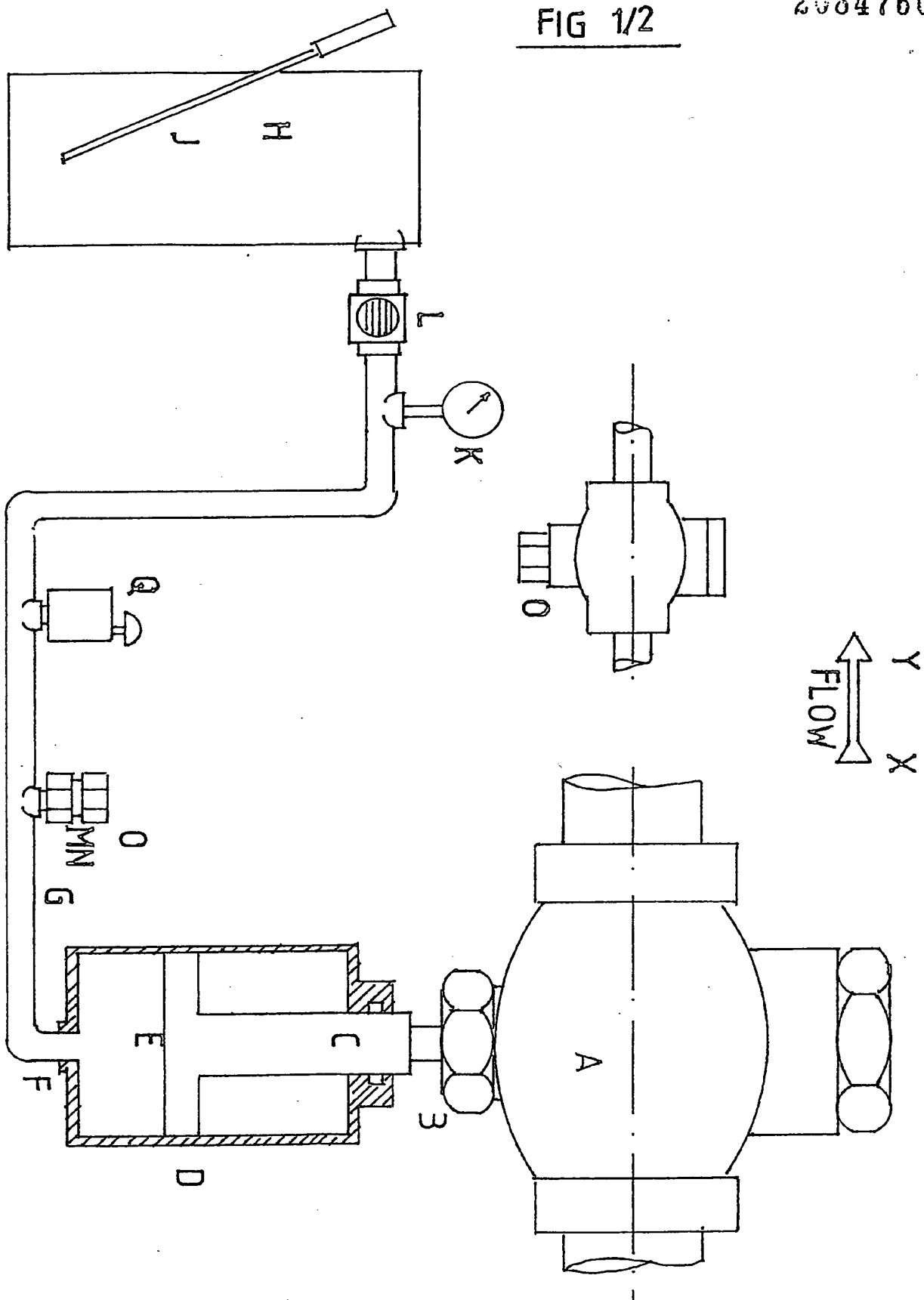
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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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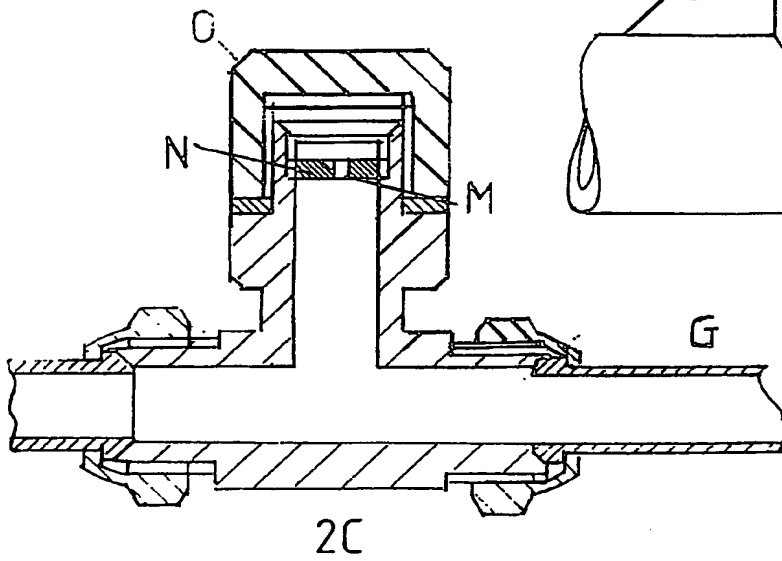
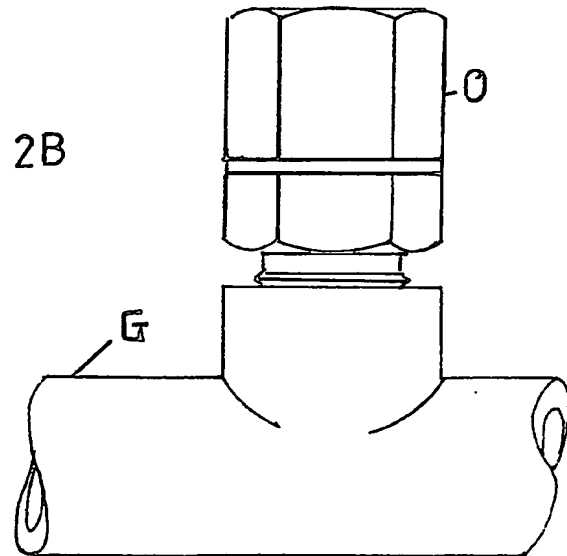
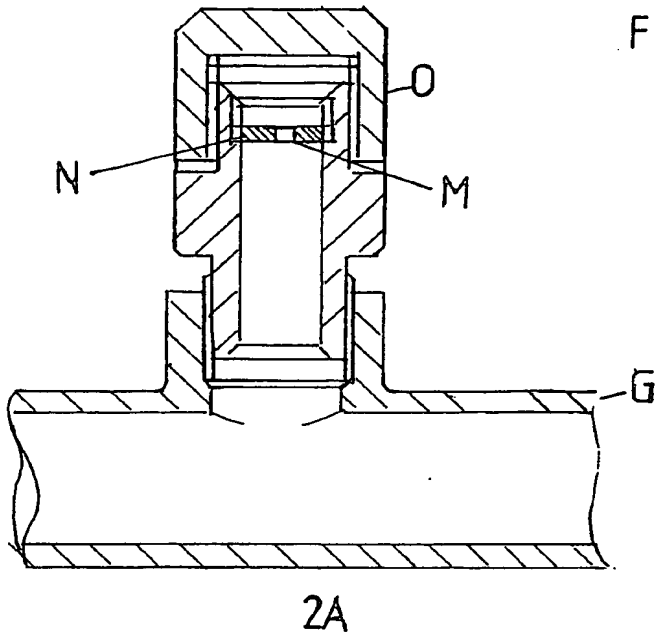
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FIG 1/2



700

FIG 2/2



SPECIFICATION

Improvements in fire and hazard protection systems

5 The present invention relates to improvements in fire and hazard protection systems. Such systems are usually encountered in chemical plants, paint, rubber and plastic factories, gas or oil-fired boiler installations, the oil industry; in particular oil fields and oil refineries, tankers, whether on sea or land, railways, power stations, and hospitals. In all these industries there are pipes conveying fluid that needs to be cut off in case of hazard or fire and other automatic means operated to limit the effect of fire, flooding, release of toxic gases or explosions liable to be caused by the release or spillage of the fluid or gas in question.

The Applicants U.K. patent No. 1370802 discloses a fluid isolating valve operated by a cap which melts thus shutting off the valve. The fusible cap is part of the valve.

The Applicants U.K. patent No. 1539852 discloses a fluid isolating valve incorporating the fusible cap but in addition the valve may be closed by manual, remote control whether mechanical, hydraulic or pneumatic to shut off the valve in the event of a hazard occurring other than fire or temperature increase.

Therefore in both Applicants patent No. 1370802 and 1539852 a fusible cap is the means which directly causes on melting a valve previously held in the open position to close.

In Applications where the isolating valve is large and the fluid to be isolated is at high pressure, this leads to the requirement of a large and strong fusible cap which may not fuse or melt sufficiently quickly for fire protection, is difficult to replace after melting and may produce mechanical shocks with its inherent characteristics of sudden shut down. Furthermore since the fusible cap is associated directly with the cut off mechanism it is not always possible to site the main shut off valve and its associated cap in the most effective position to respond to localised increases in temperature or fire which may occur anywhere throughout the pipe work and not necessarily close to the cut off valve.

It is an object of the invention to overcome these disadvantages.

According to the present invention there is provided a combined fire and other hazard protection system for a pipe work installation conveying a fluid, the system including an isolating valve normally held open, first control means in a hydraulic line connected to the piping operable for manual or automatic closure of the valve and second means remote from the valve comprising a number of fusible caps disposed at selected points in the hydraulic line which caps on fusing are operable to release the hydraulic pressure and thus close the normally open valve.

The fusible caps may include flow limiting devices to control the release of pressure from the hydraulic line. Other fire control measures or a third control means may be operated by the release of pressure from the hydraulic line; for example, water sprays

may be actuated or extinguishing gases or fluids or powders brought into action and warning devices operated. The fusible cap however, only releases hydraulic pressure of liquid which is itself chosen to be nonflammable and does not directly produce an ejection of extinguishing media.

The invention will now be described by way of example with reference to the accompanying diagrammatic drawings which shows basic system according to the invention;

Figure 1 illustrates the means of controlling the opening and closing of a valve in the main fluid line by means of a secondary pressurized system incorporating orifices sealed by fusible caps.

Figure 2 illustrates the method of applying the orifice and fusible cap in the operating pressure pipe line.

In the preferred arrangement an isolating valve (A) is situated in a fluid pipe system, referred to as the main pipe line, through which a flammable fluid flows in the direction XY.

The valve piece (B) is held in the normally open position by means of a force applied through ram (C) to the base of the stem of the valve piece (B). The ram (C) which is restrained by and protrudes out of the pressure cylinder (D) is operable by means of pressure from fluid contained in the cylinder (D) transmitted to the ram through a piston (E) the area of which is large compared with the area of the orifice (F) in the end of the pipe line (G) referred to as the operating pipe line; through which the actuating fluid passes to enter the cylinder.

Pressure is applied to the cylinder by means of a pump (H) operated manually by a handle (J). The pump is operated to increase the pressure in the pipe line as indicated by pressure gauge (K) and provides a force on the ram which will be adequate to move the main valve piece from the closed position to the open position whereby permitting the fluid to flow through the main pipe system in the direction XY.

A small non-return valve (L) situated in the pressure line after the hand pump and before the pressure gauge is then operated to the closed position thereby maintaining the pressure in the pipe system and preventing leakage of fluid through the pressure pump. The pipe system is now charged and the pressure will maintain the ram (C) in close contact with the stem of the main valve (B) which will be held in the open position until the pressure in the pipe line (G) is released permitting the ram (C) to retract into the cylinder (D) as a result of the greater force exerted by the pressure in the main valve pipe line and/or spring action on the ram (C) in the reverse direction through the base of the valve spindle (B).

Situated in the operating pipe line (G) is at least one orifice (M) the area of which may be controlled by means of a perforated disc (N) and which is sealed by means of a fusible cap (O). One or more orifices with fusible caps are incorporated in the operating pipe line at various positions which may be subjected to high temperature or fire hazard.

Also situated in the operating pipe line is one or more pressure switches (Q) arranged to activate

warning devices or control other functions.

The fusible caps sealing the orifices are of metal or material construction that will melt at a predetermined temperature lower than other components

5 incorporated in the operating pipe line (G).

In case of fire or temperature increases in excess of the melting temperature of the fusible cap, the fusible cap will melt thereby releasing the pressure in the operating pipe line and pressure cylinder, thus
10 reducing the force of the ram which retracts into the pressure cylinder and permits the valve in the main pipe line to close thereby isolating the main pipe line and preventing fluid from flowing along it.

The rate of release of the pressure is controlled by
15 the size of the orifice in the operating pipe line and thus permits the ram to retract smoothly and the valve in the main pipe line to close with the minimum of shock. The reduced pressure in the operating pipe line also permits the pressure switch
20 to close and the fire alarm system to be activated.

After the fire, the operating and main pipe lines are inspected for damage and the orifice in the operating pipe line sealed by the replacement of new fusible caps.

25 The operating pipe line is then again pressurized by means of the hand pump and the valve in the main pipe line opened in order that flow through the main pipe line may be recommended

The improvements in the fire and hazard protection system thus relate to the control of the opening and closing of the valve in the main pipe line by means of pressure in a secondary operating pipe line, the pressure in which is released by means of the melting of a fusible cap in case of fire or increase
35 in temperature above the melting point of the fusible cap.

CLAIMS (Filed 22 July 1981)

40 1. A fire isolating system in which the valve is held in the open position by fluid pressure generated by means of a pump and exerted on the valve stem by means of a fluid ram. The ram and pump are interconnected by means of pipes containing non-
45 flammable fluid. A non-return valve, pressure relief valve and pressure gauge is inserted between the pump and ram and a single or multiplicity of fusible caps are each mounted on orifices distributed throughout the pipe line. Disintegration of a fusible
50 cap as a result of fire or heat results in the release of fluid pressure from the pipe and ram cylinder thus permitting the movement of the valve stem and the change of the valve from the open to the closed position.

55 2. A system as in (1) in which the rate of pressure release is controlled by means of the size of the orifices in the operating line.

3. A system as in (1) and (2) in which the length of the operating pipe between the pump and the ram
60 and the distribution of orifices with fusible caps is such as will permit pipe line to traverse the area over which the fire hazard may be expected.

4. A system as in (1), (2) and (3) in which the reduced pressure in the pipe system operates a
65 pressure switch which will sound an alarm signal or

operate a warning device.

5. A system as in (1), (2), (3) and (4) in which when there is no fire, release of the non return valve will relieve the pressure in the operating pipe line
70 resulting in the closure of the valve. The released fluid to be contained in a reservoir and reused to open the valve by operation of the fluid pump.

6. A system as in (1), (2), (3), (4) and (5) in which fire isolating valves with individual fusible caps are
75 also placed in the flammable fluid pipe thus permitting the valve in a non fire hazard area to be operated (for example, at the entrance of the flammable fluid pipe to a building) by means of the fusible cap in the operating fluid line and the flow of flammable fluid
80 in the flammable fluid pipe to be isolated locally at the seat of the fire by valves in the flammable fluid pipes.

New claims or amendments to claims filed on 6. 11.

85 81.

Superseded claims One to 5a.

New or amended claims:-

1. An isolating system in which the valve is held in the open position by fluid pressure generated by means of a pump and exerted on the valve stem by means of a fluid ram. The ram and pump are interconnected by means of operating pipes contain-
90 ing non-flammable fluid and the area of the ram piston is large compared with the area of the operating fluid pipe. A non-return valve, pressure relief valve and pressure gauge is inserted between the pump and the ram and a single or multiplicity of fusible caps are each mounted on orifices distributed
95 throughout the pipe line. Disintegration of a fusible cap as a result of fire or heat results in the release of fluid pressure from the pipe and ram cylinder thus permitting the movement of the valve stem and the change of the valve from the open to the closed
100 position.

105 2. A system as in (1) in which the rate of pressure release is controlled by means of the size of the orifice in the operating line.

3. A system as in (1) and (2) in which the length of the operating pipe between the pump and the ram
110 and the distribution of orifices with fusible caps is such as will permit pipe line to traverse the area over which the fire hazard may be expected.

4. A system as in (1), (2) and (3) in which the reduced pressure in the pipe system operates a
115 pressure switch which will sound in alarm signal or operate a warning device.

5. A system as in (1), (2), (3) and (4) in which when there is no fire, release of the non return valve will relieve the pressure in the operating pipe line
120 resulting in the closure of the valve. The released fluid to be contained in a reservoir and reused to open the valve by operation of the fluid pump.

6. A system as in (1), (2), (3), (4), and (5) in which fire isolating valves with individual integral fusible caps are placed in the flammable fluid pipe together
125 with isolating valves operated by release of fluid pressure. Thus permitting valves in the flammable fluid pipe line, in a non-hazard area, to be operated (for example, at the entrance of a flammable fluid
130 pipe to a building) by the release of fluid pressure, or

in the case of fire, by means of the melting of any or all of the fusible caps in the operating fluid line. The flow of flammable fluid in the flammable fluid line is also isolated locally at the seat of a fire by fusible
5 caps mounted integrally on the valves in the flammable fluid pipes.

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